

WHAT IS CLAIMED IS:

1. A process for removing residues from the microstructure of an object comprising steps of :

preparing a remover including CO₂, an additive for removing the residues and a co-solvent for dissolving said additive in said CO₂ at a pressurized fluid condition; and

bringing the object into contact with said remover so as to remove the residues from the object .
2. The process according to claim 1, wherein said additive includes a basic compound.
3. The process according to claim 2, wherein said basic compound is at least one element selected from the group consisting of quaternaryammoniumhydroxide, quaternaryammoniumfluoride, alkylamine, alkanolamine, hydroxyamine, and ammoniumfluoride.
4. The process according to claim 1, wherein said co-solvent is alcohol.
5. The process according to claim 2, wherein said co-solvent is an alcohol and said basic compound is a quaternaryammoniumfluoride and/or a quaternaryammoniumhydroxide.
6. A process for removing residues from the microstructure of an object comprising a step of :

contacting the object with a remover including a supercritical CO₂, a compound having a hydroxyl group, and a fluoride of formula NR₁R₂R₃R₄F, where R represents a hydrogen or alkyl group.
7. The process according to claim 5, wherein said Rs are alkyl groups.
8. The process according to claim 5, wherein said fluoride is a tetramethylammoniumfluoride and said compound is an alcohol.
9. The process according to claim 6, wherein said remover includes substantially no water.
10. The process according to claim 6, further comprising a step of rinsing the object by using a solvent including substantially no water.

11. A process for removing residues from the microstructure of an object comprising steps of:

placing the object in a vessel;

feeding into the vessel CO₂, a compound having a hydroxyl group, and a fluoride of formula NR₁R₂R₃R₄F, where R represents a hydrogen or alkyl group; and

maintaining said CO₂ including said fluoride and said compound at a supercritical condition to contact the object with said CO₂, wherein a concentration of at least one of said fluoride and said compound in said CO₂ is so adjusted as to control an etch rate of etching the object so as to remove the residues.

12. A process for removing residues from a semiconductor wafer comprising steps of:

ashing a resist on a surface of the semiconductor wafer; and

contacting the semiconductor wafer with supercritical CO₂ including a compound having a hydroxyl group and a fluoride of formula NR₁R₂R₃R₄F, where R represents a hydrogen or alkyl group, so as to remove ashed resist from the semiconductor wafer.

13. The process for removing residues from the microstructure of an objects according to claim 1, further comprising the steps of:

placing the object inside a vessel, wherein the vessel is provided with at least one inlet for feeding CO₂ into said vessel, an additive for removing the residues, and a co-solvent for dissolving the additive in the CO₂;

pressurizing the CO₂ to be fed into said vessel; and

heating the pressurized CO₂ in said vessel so as to maintain the pressurized CO₂ at a predetermined temperature.

14. The process according to claim 13, further comprising the step of:

mixing the additive and the co-solvent before being fed into said vessel.

15. The process according to claim 13, further comprising the step of:

providing a controller for adjusting a feed rate of at least one of the additive and the co-solvent to be fed into said vessel.

16. The process according to claim 13, further comprising the step of:
providing a thermostat for said vessel for keeping the pressurized CO₂ in said vessel at the predetermined temperature.
17. An apparatus for removing residues from the microstructure of an object, comprising:
a vessel for placing the object inside, wherein the vessel is provided with at least one inlet for feeding CO₂ into said vessel, an additive for removing the residues, and a co-solvent for dissolving the additive in the CO₂;
a pump for pressurizing the CO₂ to be fed into said vessel; and
a heater for heating the pressurized CO₂ in said vessel so as to maintain the pressurized CO₂ at a predetermined temperature.
18. The apparatus according to claim 17, further comprising:
a mixer for mixing the additive and the co-solvent before being fed into said vessel.
19. The apparatus according to claim 17, further comprising:
a controller for adjusting a feed rate of at least one of the additive and the co-solvent to be fed into said vessel.
20. The apparatus according to claim 17, further comprising:
a thermostat for said vessel for keeping the pressurized CO₂ in said vessel at the predetermined temperature.